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(54) Title: DEVICE AND METHOD FOR THE AUTOMATIC MILKING OF ANIMALS			
(57) Abstract <p>The invention relates to a milking device and method for the automatic milking of animals in a milking parlour. The animals are housed in a dwelling area with dwelling stalls (11) which are suitable for permanent housing and are provided with boundary means, operated by control systems, for confining an animal. In order to prevent soiling of the aisles in the dwelling area, the milking device may comprise means for shortening the time that animals to be milked are present in the aisle.</p>			

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Device and method for the automatic milking of animals

The invention relates to a milking device for the automatic milking of animals according to the preamble
5 of Claim 1.

Such a device is known from EP 0270165, which describes a milking device for cows which is constructed on a free stall housing. In such a free stall housing, free stalls, where the animals can rest,
10 are provided, and there is a walking area in which the animals move around when they are not in the free stall housing. The walking area is designed in such a way that droppings deposited there by the animals can be removed in a simple manner, for example by having
15 manure pits provided at various points in the floor. The floor is also constructed in a special way. In the case of many existing milking parlours, which are tie-up cowsheds, this construction is not present. In the case of these tie-up cowsheds the floor is of a totally
20 different design and is not suitable for allowing the animals to move around freely on the aisles. The object of the invention is to make the tie-up cowsheds suitable for use with a milking parlour in which the milking is automatic.

25 For this purpose, according to the invention the milking device is designed according to the characterizing part of Claim 1. By using dwelling stalls, in which the animals to be milked can stay more or less permanently and can be confined by the control
30 system, it is possible to make the animals go to the milking parlour at certain times which are determined by the control system. This means that they are in the aisle for only a short time, so that the aisle is hardly soiled at all with manure and the like.

35 According to a further improvement, the device is designed according to Claim 2. By this measure, it is

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possible in a simple manner to confine an animal in the dwelling stall.

According to another embodiment, the device is designed according to Claim 3. By this measure, a
5 saving can be made on the costs of the boundary means.

According to one embodiment, the milking device is designed according to Claim 4. By this measure, the control on the behaviour of the animals is improved, so that, for example, it can be better recorded which
10 animals have gone to or are near the milking parlour and, if problems are found, for example during the milking, it is also known in which parlour the animal concerned is confined.

According to one embodiment, the milking device is
15 designed according to Claim 5. By this measure, after the dwelling stalls have been opened for a group of animals, the animals are guided to the entrance of the milking parlour, where they are milked and, after they have left the milking parlour, are guided to an empty
20 dwelling stall. In this case as many animals as are released in one go from the dwelling stalls will generally be able to stay in the area between the entrance means and the milking parlour.

According to a further improvement, the milking device is designed according to Claim 6. By this measure, the number of animals that is released in one go from a dwelling stall can be greater than the number of animals that can go into the milking parlour in one go.

30 According to a further improvement, the milking device is designed according to Claim 7. By this measure, the entrance or the exit is cleared in a simple manner.

According to one embodiment, the device is
35 designed according to Claim 8. By this measure, the

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length of the aisle can be shortened, so that the animals are guided better to the dwelling stall or to the milking parlour.

According to one embodiment, the milking device is
5 designed according to Claim 9. By this measure, it is ensured that the animals do not stand unnecessarily in the aisle, so that the capacity of the device is not thereby restricted.

The invention also comprises a method according to
10 the preamble of Claim 10. Such a method is known from US 4010714. This document shows a device in which the animals to be milked stand in a parlour and an automatic milking device is placed under each animal to be milked. Special and expensive structural facilities
15 are necessary for this, which is a disadvantage.

In order to avoid this disadvantage, the method is carried out according to the characterizing part of Claim 10. In this case the dwelling stalls of a number of animals to be milked are opened periodically, and
20 the animals are confined again after milking. In this way, the advantages of milking in a milking parlour are combined with the structural facilities of existing tie-up cowsheds.

According to an improvement, the method is carried
25 out according to Claim 11 or 12. By this measure, the milking can be carried out without supervision.

According to a further improvement, the method is carried out according to Claim 13. By this measure, the equipment present in the milking parlour is used as
30 efficiently as possible.

According to one embodiment of the method, the method is carried out according to Claim 14. By this measure, the capacity of the device is increased and soiling of the aisles is avoided as far as possible.

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The invention will be explained below with reference to a drawing, in which:

Figure 1 shows a diagrammatic top view of a first embodiment of a tie-up cowshed with an automatic 5 milking device;

Figure 2 shows a diagrammatic top view of a second embodiment of a tie-up cowshed with an automatic milking device;

Figure 3 shows detail III from Figures 1 and 2; and
10 Figure 4 shows view IV-IV from Figure 3.

In the various figures, corresponding components are indicated as far as possible by the same reference numerals.

Figure 1 shows a shed 1, which serves as a dwelling area for cows to be milked, and which has therein two rows of dwelling stalls 11, in which the cows stand with their tails facing each other. A feed passage 17 is provided between the long wall of the shed 1 and a row of dwelling stalls 11. An aisle 9 runs 20 between the two rows of dwelling stalls 11. The dwelling stalls 11 are designed in such a way that a cow can enter or leave the dwelling stall 11 by way of the aisle 9. While it is in the dwelling stall 11, the cow can take feed from the feed passage 17. The feed 25 passage 17 is bounded by a barrier 10. The shed is provided with doors 18.

A manure channel 12 is provided along the rear side of the dwelling stalls 11, in the longitudinal direction of the aisle 9. While it is in the dwelling 30 stall 11, the cow will produce droppings, which fall into this manure channel 12. In order to be able to remove these droppings from the manure channel 12, a manure slide 13 is provided in a known manner, by means of which manure slide the droppings are conveyed 35 through an opening in the wall of the shed 1 and

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deposited in a known manner on one of the manure heaps 19, which are situated behind the shed.

On the other short side of the barn 1, facilities are provided for milking the animals present in the 5 barn. These facilities consist of a milking parlour 2 with an entrance barrier 4 and an exit barrier 5. Milking equipment 3 for milking the cows is placed in the milking parlour 2. The milking equipment 3 may comprise means for the automatic fitting of teat cups 10 around the teats of a cow present in the milking parlour 2. The milking equipment 3 can, if desired, function without supervision, by means of a control system. For this purpose, the device is designed in such a way that the cows to be milked can go into the 15 milking parlour 2 and be milked there without human intervention.

At the entrance barrier 4 there is a waiting area for cows to be milked 6, and at the exit barrier 5 there is a waiting area for milked cows 7. The waiting 20 areas 6 and 7 are dimensioned in such a way that a small number of cows can always be released simultaneously from the dwelling stalls 11, for example 4 or 6 cows, which then await their turn in the waiting area for cows to be milked 6. After milking, the cows 25 can wait a moment in the waiting area for milked cows 7, or can return immediately to their dwelling stalls 11. After the last cow has returned to its dwelling stall 11, they are confined again in the manner discussed below, and the following group of cows is 30 released from the dwelling stalls.

In order to ensure that the cows can find their way quickly along aisle 9 to their dwelling stalls, the length of the aisle 9 can be adapted by means of a barrier 16 which is movable in the longitudinal 35 direction of the aisle 9. In order to ensure that the

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animals do not remain standing for a long time in the aisle 9, a herding bar 14 is movable in the longitudinal direction of the aisle 9. Chains 15 hang from the herding bar 14, which chains can touch the 5 cows in the aisle 9 and possibly in the dwelling stall 11, causing them to move in the direction of movement of the herding bar 14. By means of the herding bar 14, the animals can be driven from the dwelling stalls to the waiting area for animals to be milked 6, or from 10 the waiting area for milked animals 7 to the dwelling stalls 11.

In an alternative embodiment, instead of the single milking parlour 2 with one or two waiting areas 6 and 7, a number of milking parlours can be used, as 15 many as there are animals released simultaneously. The milking parlours can be grouped in many known ways, for example in a row, herringbone, in tandem, and also as a carrousel, the choice depending primarily on the desired capacity. It is also possible not to have both 20 waiting areas 6 and 7, but for only one waiting area to be present. In that case the animals can go, for example, directly from the dwelling stall 11 to the milking parlour 2 and return as a group, or if they are driven in a group to the waiting area 6, they can 25 return directly from the milking parlour 2 to the dwelling stall 11.

It is assumed above that a milked animal returns to the dwelling stall 11 from which it has come, but this is not necessary. It is possible to shorten 30 waiting times by using a number of empty dwelling stalls 11 as a new dwelling area for milked animals.

Figure 2 shows a milking device which is comparable to that of Figure 1, in which milking device the feed passage 17 has been placed between the two 35 rows of dwelling stalls 11, so that there are now two

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aisles 9, each provided with a movable barrier 16 and a herding bar 14. The cows stand with their heads facing each other. In this embodiment the swing barrier 8 is a double barrier, so that both the waiting area for cows
5 to be milked 6 and the waiting area for milked cows 7 can be shut off at the same time. This means that the freedom of movement of the cows on the aisle 9 is restricted, with the result that the soiling there is reduced.

10 The dwelling stalls 11 are shown in greater detail in Figures 3 and 4. The dwelling stalls 11 are bounded on the long side by a partition barrier 20 and at the side facing the feed passage 17 by an end barrier 21. Said end barrier 21 permits eating from the feed
15 passage 17, but impedes the passage of an animal in the dwelling stall 11. The animals are confined in the dwelling stall 11 by means of a confining barrier 22, which is operated by an air cylinder 23. In the embodiment shown, four dwelling stalls 11 are shut off
20 simultaneously by the confining barrier 22. However, it is also possible for the confining barrier 22 to be designed in such a way that other numbers of dwelling stalls 11 are shut off simultaneously, or that each dwelling stall 11 can be shut off separately. In the
25 embodiment shown, the confining barrier 22 is in the form of a U-shaped frame. Examples of other embodiments are swing barriers or a chain which is tensioned. Apart from the confining barrier 22 shown here, other means are also possible for confining an animal in the
30 dwelling stall 11.

A presence sensor (not shown) can be accommodated in the dwelling stall 11, by means of which presence sensor it can be established whether a cow to be milked or a milked cow has left the dwelling stall 11 and
35 returned again. If desired, the cow could be provided

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with electronic identification means, in order to establish its identity in the milking parlour 2. These electronic identification means can also be used to establish whether the animal is back in the dwelling stall 11, and to establish which animal is in a particular dwelling stall 11. It can then also be known in the control system where a particular animal is, so that it can be found easily, for example in cases of sickness or the like.

10 The device is controlled by a control system which is combined, for example, with the control system of the milking equipment 3. In the control system the movements of the cows in the aisles 9 are followed, and procedures can be incorporated for controlling the
15 herding bar 14, the swing barrier 8 and a movable barrier 16, depending on the movements of the animals. The cows to be milked are influenced in such a way by this that their duration of stay in the aisles 9 is as short as possible, with the result that the latter are
20 soiled as little as possible. By periodically opening the dwelling stalls 11 of a limited number of animals and making these animals move to the milking parlour 2, it is ensured that they can be milked there by the automatic milking equipment 3 without supervision.

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Claims

1. Milking device for the automatic milking of animals, comprising a milking parlour (2) provided with milking equipment (3), a dwelling area (1) provided with dwelling stalls (11) for housing animals to be milked, an aisle (9) between the dwelling stalls and the milking parlour, and barriers for guiding animals to be milked from the dwelling area to and from the milking parlour, characterized in that the dwelling stalls (11) are suitable for permanent residence of the animals to be milked and are provided with boundary means (22) operated by a control system, for confining an animal.
- 15 2. Milking device according to Claim 1, characterized in that the boundary means comprise a movable barrier (22).
3. Milking device according to Claim 1 or 2, characterized in that the boundary means can confine animals in several dwelling stalls simultaneously.
- 20 4. Milking device according to Claim 1, 2 or 3, characterized in that the dwelling stalls are provided with means for establishing the presence of an animal and possibly the identity of the animal present.
- 25 5. Milking device according to one of the preceding claims, in which the milking parlour (2) is provided with an entrance (4) and an exit (5), characterized in that the barriers comprise entrance means (8) operated by the control system, for alternately placing the aisle (9) in communication with the entrance (4) or the exit (5) of the milking parlour (2).
- 30 6. Milking device according to Claim 5, characterized in that a waiting area (6, 7) is provided at least at the entrance (4) or the exit (5) of the milking parlour (2).
- 35

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7. Milking device according to Claim 5 or 6, characterized in that the entrance means comprise a swing barrier (8).

8. Milking device according to one of the preceding 5 claims, characterized in that on the side facing away from the milking parlour (2) the aisle (9) is bounded by a barrier (16) which is movable by the control system.

9. Milking device according to one of the preceding 10 claims, characterized in that the aisle (9) is provided with herding means (14, 15) which are operated by the control system.

10. Method for the automatic milking of animals in a milking parlour (2), in which the animals are confined 15 more or less permanently in dwelling stalls (11), characterized in that the confinement of a number of animals to be milked is periodically interrupted, after which these animals can leave the dwelling stall (11) and are guided to the milking parlour (2), and are 20 confined again in a dwelling stall (11) after milking.

11. Method according to Claim 10, characterized in that the animals to be milked are guided to the milking parlour (2) by the automatic movement of barriers (4, 8, 16, 22).

25 12. Method according to Claim 10 or 11, characterized in that the milked animals are guided from the milking parlour (2) to a dwelling stall (11) by the automatic movement of barriers (5, 8, 16, 22).

30 13. Method according to Claim 10, 11 or 12, characterized in that, before and/or after milking, the animals are guided into a waiting area (6, 7), in order to make an aisle (9) between the milking parlour (2) and the dwelling stalls (11) available for other animals.

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14. Method according to one of Claims 10-13,
characterized in that the animals are stimulated to
move after the interruption of the confinement in the
dwelling stall (11), after leaving the milking parlour
5 (2) and/or after leaving the waiting area (7).

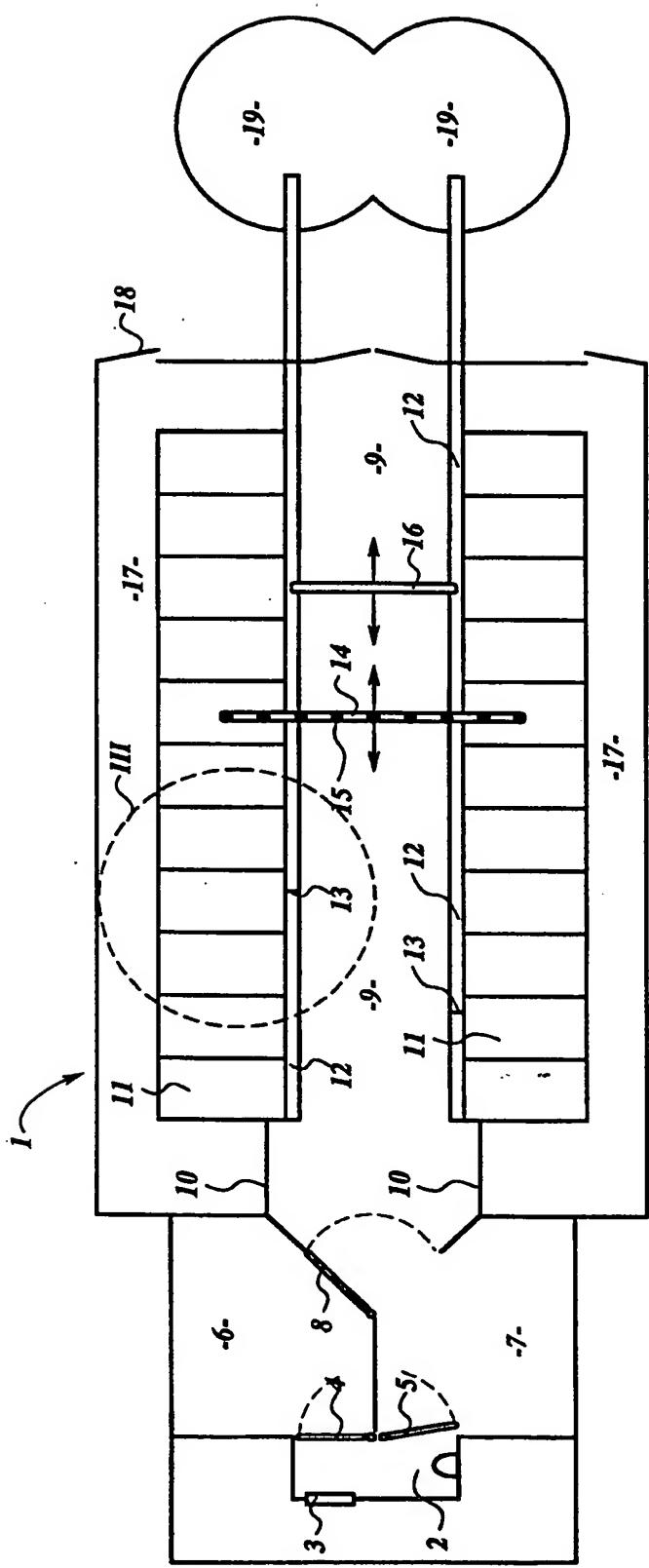


Fig. 1

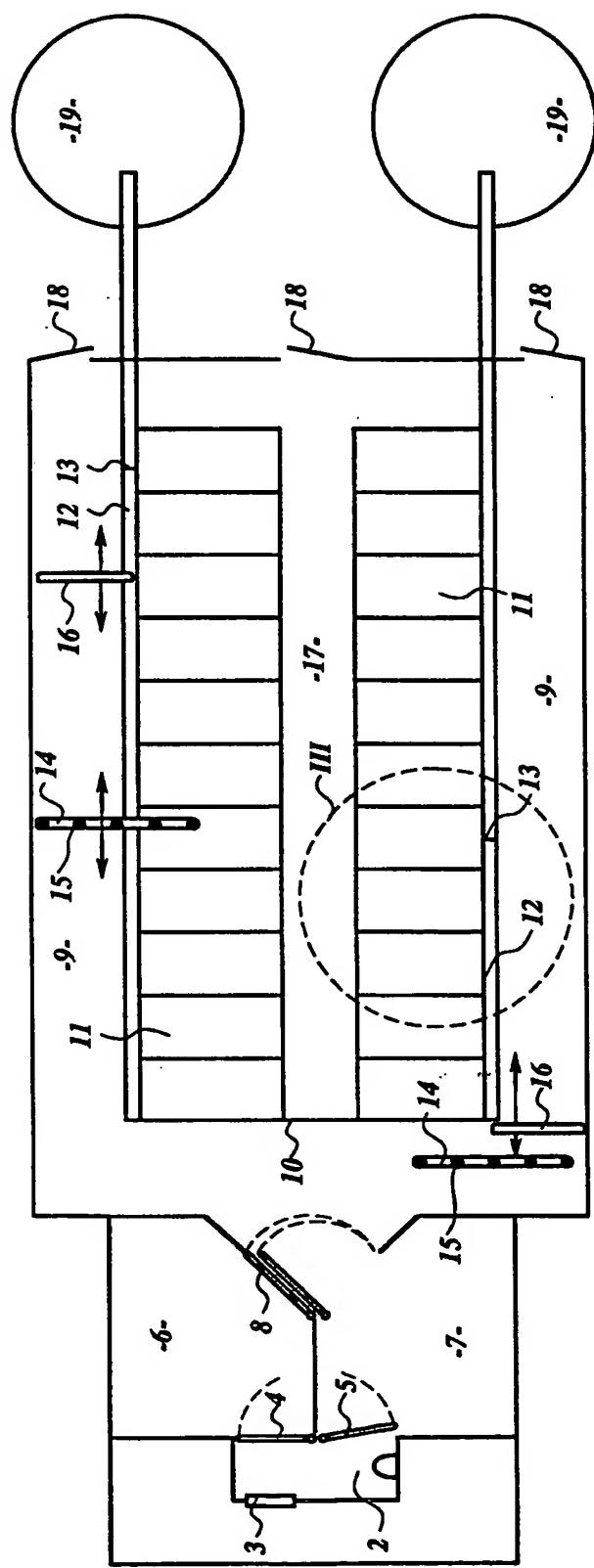


Fig. 2

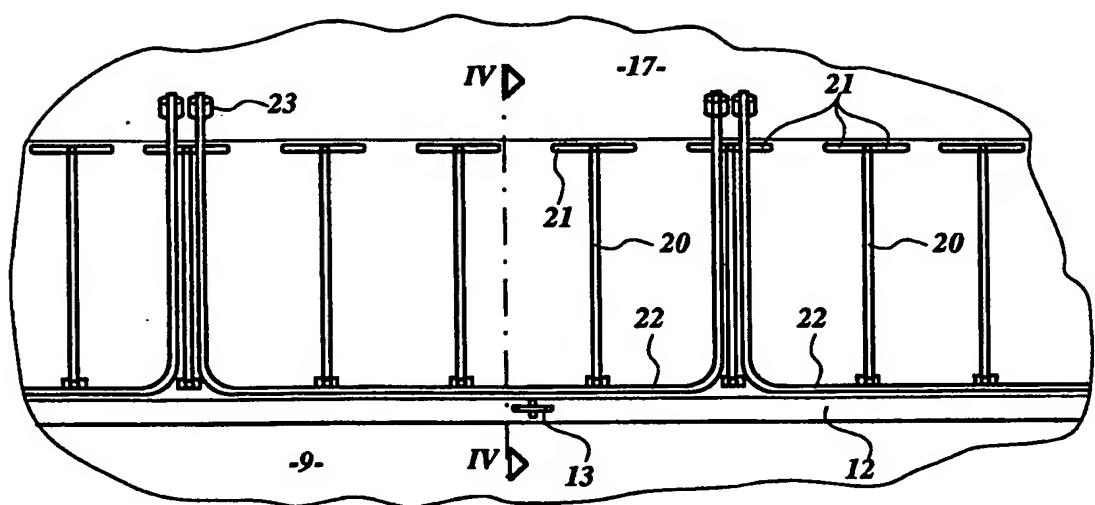


Fig. 3

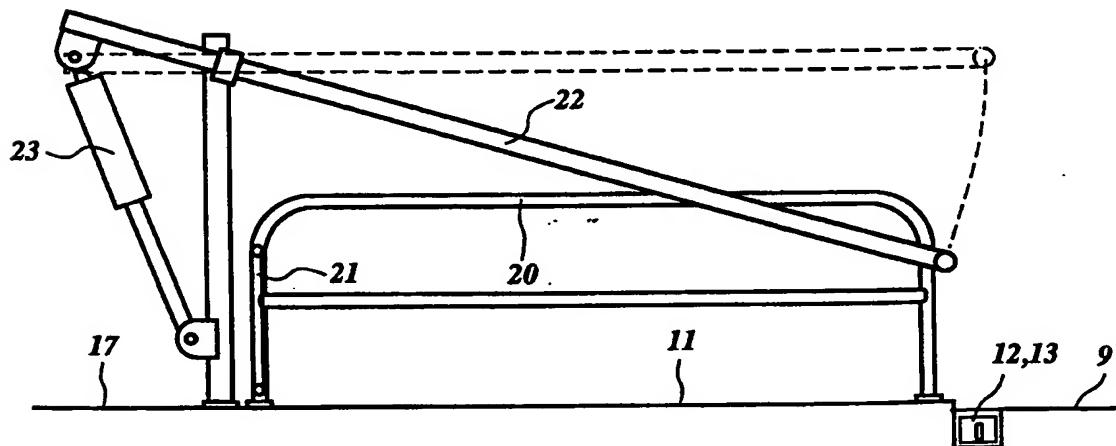


Fig. 4

INTERNATIONAL SEARCH REPORT

International Application No
PCT/NL 99/00081

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 A01K1/12 A01K1/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 A01K A01J

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 636 313 A (MAASLAND NV) 1 February 1995 see column 3, line 45 - column 6, line 38 see claims; figures --- EP 0 753 249 A (MAASLAND NV) 15 January 1997 see column 2, line 26 - column 3, line 41 see claims; figures --- ---/---	1,4,5,7, 10,14 1,5, 7-10,14
A		

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

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INTERNATIONAL SEARCH REPORT

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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